

(12) United States Patent

Miralles et al.

US 8,669,224 B2 (10) **Patent No.:**

(45) Date of Patent: Mar. 11, 2014

(54) USE OF HYDROXYCARBOXYLATES FOR WATER HARDNESS CONTROL

(75) Inventors: Altony J. Miralles, Woodbury, MN (US); Carter M. Silvernail, St. Louis

Park, MN (US)

Assignee: Ecolab USA Inc, St. Paul, MN (US)

Notice: Subject to any disclaimer, the term of this

patent is extended or adjusted under 35

U.S.C. 154(b) by 655 days.

(21) Appl. No.: 12/560,848

(22)Filed: Sep. 16, 2009

(65)**Prior Publication Data**

US 2010/0229897 A1 Sep. 16, 2010

Related U.S. Application Data

- (60) Provisional application No. 61/097,398, filed on Sep. 16, 2008.
- (51) Int. Cl. C11D 3/20 (2006.01)C11D 3/04 (2006.01)C11D 7/06 (2006.01)(2006.01)C11D 7/26
- (52) U.S. Cl. CPC C11D 3/044 (2013.01); C11D 3/2086 (2013.01); C11D 7/06 (2013.01); C11D 7/265

(2013.01)USPC 510/488

Field of Classification Search

CPC C11D 3/044; C11D 3/2086; C11D 7/06; C11D 7/265 See application file for complete search history.

(56)References Cited

U.S. PATENT DOCUMENTS

3,692,685 A	9/1972	Lamberti et al.
3,865,755 A	2/1975	Lannert
3,948,985 A	4/1976	Blumbergs et al.
3,993,575 A *	11/1976	Howanitz et al 510/434
4,014,929 A	3/1977	Stahlheber
4,049,467 A *	9/1977	Rubin 134/2
4,115,293 A *	9/1978	Schoenholz et al 510/117
4,124,522 A *	11/1978	Barton 134/42
4,663,071 A	5/1987	Bush et al.
4,867,901 A	9/1989	Bosch et al.
4,904,824 A	2/1990	Horng et al.
5,015,466 A	5/1991	Parran, Jr. et al.
5,015,467 A	5/1991	Smitherman
(Continued)		

FOREIGN PATENT DOCUMENTS

EP 0463802 B1 9/1998 WO WO97/19158 5/1997

OTHER PUBLICATIONS

Simultaneous Determination of Ascorbic, Citric, and Tartaric Acids by Potentionmetric Titration with PLS Calibration, Akhond et al., Pleiades Publishing, 2006, pp. 804-808.*

(Continued)

Primary Examiner — Gregory Webb (74) Attorney, Agent, or Firm — Amy J. Hoffman; Andrew D. Sorensen

(57)ABSTRACT

The present invention relates to compositions including threshold agents, and methods of use thereof. The threshold agents can include hydroxycarboxylate compounds present at an amount sufficient to control water hardness. The threshold agents are present in the wash solution at a molar amount less than the molar amount of water hardness ions present.

8 Claims, 8 Drawing Sheets

